

Claims

1. A neutron generator, comprising:

- a) an electron bombardment source;
- b) a high voltage acceleration stage; and
- c) an occluded reaction target, wherein said neutron generator has an ion extraction slit and focusing apertures each being equal to or greater than 3mm.

2. A neutron generator according to claim 1, further comprising:

- d) a hollow needle, said reaction target being mounted within said hollow needle.

3. A neutron generator according to claim 1, wherein:

said neutron generator is capable of delivering on the order of  $\geq 10^8$  neutrons per second operating at 25 watts.

4. A neutron generator according to claim 2, wherein:

said electron bombardment source and said acceleration stage deliver an ion beam of a few tens of microamperes to said target operating at 75-500 KeV.

5. A neutron generator according to claim 1, further comprising:

    d) means for steering a beam of ions produced by said electron bombardment source.

6. A neutron generator according to claim 5, wherein:

    said means for steering is a rasterizing means.

7. A neutron generator according to claim 1, wherein:

    said electron bombardment source includes a filament which operates at approximately 15 watts at approximately 3 volts.

8. A neutron generator according to claim 5, wherein:

    said steering means operates at approximately  $\pm$  10-100 volts.

9. A neutron generator according to claim 2, wherein:

    said exit slit is located approximately 5cm from said needle and said needle is approximately 10cm long.

10. A neutron generator according to claim 1, wherein:

    said generator produces 14.1 MeV neutrons.

11. A method for treating a tumor with an electron beam neutron generator, said method comprising:

- a) coupling a hollow needle to the generator;
- b) locating a thermonuclear target inside said needle at one end thereof;
- c) locating the end of the needle with the target at a first location adjacent to the tumor;
- d) directing ions produced by the electron beam into the needle onto the target.

12. A method according to claim 11, wherein:

    said step of locating includes inserting the needle into the tumor.

13. A method according to claim 11, wherein:

    said step of directing includes steering the ions to the shape of the tumor.

14. A method according to claim 13, wherein:

    said step of steering includes rasterizing the ion beam.

15. A method according to claim 11, wherein:

the thermonuclear target is chosen to approximate the shape of the tumor.

16. A method according to claim 11, further comprising:

e) relocating the end of the needle to a second location at a different angle to the tumor; and  
f) repeating said step of directing ions.